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Some Blood-Sucking Flies of Saskatchewan

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OTTAWA

SOME BLOOD-SUCKING FLIES OF SASKATCHEWAN

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INTRODUCTION

LAST summer (1917) the author in co-operation with Dr. S. Hadwen of the Health of Animals Branch, Department of Agriculture, made a preliminary survey of the blood-sucking flies affecting stock and man in the vicinity of Saskatoon. Because of other important investigations occupying their attention, including the study of bot-flies, and so-called "Swamp Fever," which causes serious losses among horses, the time allotted to the survey was necessarily limited. It is, therefore, proposed to discuss tentatively only a few of the more frequently occurring forms that were encountered within a radius of 50 miles of the city of Saskatoon, Sask. Inasmuch as the environmental conditions existing in this area are fairly representative of those throughout the southern half of the province, the remarks that follow will be found to be more or less applicable to the whole of this region, where wooded bluffs are relatively few and far between. In the northern territory, as yet unexplored by the author, it is not unlikely that in the more sheltered wooded districts, more favourable environmental conditions will prove such as to have an important bearing on the constitution of the fauna of blood-sucking flies, with a probable consequent greater fertility in species numbers. It could not but be remarked that the area studied yielded a surprising paucity of forms especially of horse-flies, although in actual numbers their dominance could not be denied.

Attention was principally paid to the three families known as the Culicidae or Mosquitoes, the Simuliidae or Black-flies and the Tabanidae or Horse-flies, all of which have aquatic larvae.

MOSQUITOES*

Until Knab published his paper "Observations on the Mosquitoes of Saskatchewan," Smithsonian Miscellaneous Collections, Vol. 50, pt. 4, 1908, pp. 540-547, very little was known about the prairie species or their habits. There still remains much to be learned. The great majority of the species of the prairie region of the northwest belong to the genus *Aedes*. These typically northern forms develop in the melting snow-water of early spring.

FIG. 1.—This mosquito, *Aedes fletcheri*, is commonly encountered on the prairie during the summer months. When disturbed from its resting place among the grass it will readily attack human beings and stock. Enlarged. (original).

To some, the great abundance of the prairie mosquitoes has presented a puzzling question because of the

* The author desires to express his thanks to Dr. H. G. Dyar of the Smithsonian Institution, Washington, D.C., for kindly identifying the species of mosquitoes.

comparative scarcity of water—essential to mosquito breeding—on the prairies during the summer months. There is only a single annual brood of prairie mosquitoes, and the adults are apparently long lived. The eggs are laid in the late summer on the ground, where they remain until the following spring, when they readily hatch into "wrigglers" in the water produced from the melting snow. Many sloughs persist well into the summer, but frequent investigation during July and August failed to reveal the presence of larvae in these stagnant waters, the first and only generation having departed earlier. Knab, however, found the larvae in large numbers in alkali swamps and ditches in May and June (1907). In one or two instances *Aedes canadensis* Theob. and *Aedes sansoni* D. and K. were particularly prevalent in the immediate vicinity of these sloughs during July. Peculiar to swampy creeks and ravines opening into the Saskatchewan river, one finds *Aedes mimesis* Dyar, *Aedes vexans* Meig., and *Aedes aestivalis* Dyar, all of which are more or less persistent in their attacks on man. *A. canadensis* and *A. sansoni* were occasionally encountered in large swarms when disturbed from their shaded resting places among the grasses in these ravines.

The most widely distributed species on the prairies are *Aedes spenceri* Theob., *Aedes fletcheri* Coq. (Fig. 1) and *Aedes curriei* Coq. The first two are very prevalent around Saskatoon, and it is principally due to their vicious habits that the existence of the prairie inhabitants is rendered almost intolerable at times. They are rarely to be encountered in the towns, although they enter the porches of houses on the outskirts and attack the occupants. Their attacks on stock are equally troublesome, and the provision of protective fly-nets on horses is a wise precaution now generally adopted.

From the nature of the life-history facts here outlined, it will be readily imagined how difficult is the problem of mosquito control on the prairies. None of the species appear to undertake long migratory flights, so that the problem is more or less a local one, but a local one of immense size. Undoubtedly, much could be accomplished in the vicinity of townships by oiling the temporary pools of the early spring wherever larvae are found. The judicious application of kerosene, crude oils of paraffin and asphaltum base will provide a surface film which will readily kill the larvae by suffocation as well as by their toxic properties. An alternative method, which has been employed in anti-mosquito work with great effect, is the application of a preparation known as "larvacide" manufactured according to the following formula*:—

Resin	150 to 200 lbs.
Soda (caustic)	30 lbs.
Carbolic acid	150 gals.

The product readily emulsifies in water, but, unfortunately, brackish or alkali waters render it inert. Combined with its marked toxicity it has the advantage of cheapness, a fact which makes it preferable to the more expensive kerosene oil.

Sloughs near towns might be filled up with refuse wherever possible, the work to be accomplished during the summer and fall in preparation for the thawing of the following spring.

BLACK-FLIES

The virulence of the bite which the species of this family are capable of inflicting is in inverse ratio to their size. In different parts of the continent they are known variously as "buffalo-gnats," "turkey-gnats," and "sand-flies," but the designation of black-flies is by far the most suitable in that it is not so narrow in its content as the others, each of

* Le Prince, J. A., and Orenstein, A.J., Mosquito Control in Panama, New York, 1916, p. 174.

which emphasises one particular habit of a single or limited number of species.

In the early stages of their life-histories black-flies are aquatic, and their gregarious, greenish-gray larvae (Fig. 2) are to be found attached to stones in the rapids of streams and rivers. They maintain their position in spite of the current by means of a suctorial disk at the posterior end of their body, and by means of the peculiarly adapted head-fans they contrive to sweep minute vegetable organisms such as diatoms and desmids into their mouths. Should they, by any chance, become dislodged from the security of their position, they have the power of secreting from the mouth, a silk-thread. By fixing it to a stationary object, the chances of their being washed downstream before they encounter another suitable anchorage are considerably decreased.

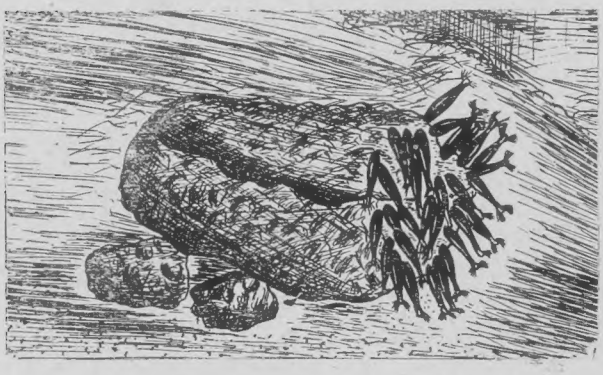

FIG. 2.—Larvae of black-fly, attached to the surface of a stone in the bed of a rapid stream. About natural size. (Original).

Before pupating the larva spins a closely woven slipper-shaped cocoon, open anteriorly. It is securely fixed to the stones, and the thread-like breathing filaments are exposed.

The velvety black flies lay their eggs on the exposed surfaces of stones or weeds, and some penetrate beneath the surface to deposit their eggs on the water-washed surface of stones. The whole life-history occupies a period of about six weeks.

We were able to witness how intense is the annoyance and injury inflicted on cattle by the persistent and tenacious attacks by myriads of these black-flies. At the beginning of July the species most abundant was *Simulium similis* Mall. On the evening of July 4 some cows staked out on the prairie in close proximity to the Saskatchewan river and not more than two miles from Saskatoon, were observed to be straining on their tethers and lowing pitiably. A closer view revealed the presence of dense swarms of this species, which extended all round the animals for at least eight to ten yards. The animals were very restless, and a close examination revealed the fact that on their forequarters, abdomen, and udders the flies were congregated in dense masses and were distended with blood. On these regions the skin was broken and blood oozed from innumerable punctures. The flies were also entering the nostrils, ears, and eyes.

The damage caused by black-flies results from their painful bites and the loss of blood which ensues. They have frequently been guilty of inflicting extensive losses among live-stock, but so far have not been incriminated as vectors of disease-causing organisms. At Duck Lake in Saskatchewan it was stated on good authority that in 1913 about 100 head of cattle died from the attacks of black-flies. The first swarms are generally in evidence about the beginning of June, and the infestations may recur at intervals as late as September and October. One witness testified to the pungent, mustard-like taste of the flies.

The Saskatchewan river, the only apparently suitable water for the breeding of black-flies (Fig. 4), is six

miles distant from Duck Lake, and there is little doubt but that the flies either voluntarily or compulsorily undertake migratory flights which carry them long distances from their places of breeding. Probably they are assisted in this by mild, favouring breezes.

FIG. 3.—Adult black-fly, a troublesome pest of cattle and horses on the prairie and often causing the death of the animal attacked. (Modified after Lugger).

At the present time the only measure of control that commends itself is either to burn "smudges" which many farmers do and thus ward off the flies from the animals by the resulting dense smoke, around which they congregate for protection, or to dress their coats with some disagreeable preparation of oil or grease. Fish oil alone or in combination with other materials is one of the best repellants. A mixture* consisting of three parts of fish oil and one part kerosene spread over sores gives excellent results. In smearing animals with the various strong-smelling oils care should be taken not to use machine oil or other powerful oils, the repeated application of which tends to remove the hair. The dressing should be renewed once a day in the fly season.

The most satisfactory method of control would be to kill the larvae in the streams, but in large rivers the difficulty of making any extensive application of toxic substances is out of the question. Further, the danger to stock and human beings, who may use the treated water, must be duly emphasized. In some experiments recently carried out with

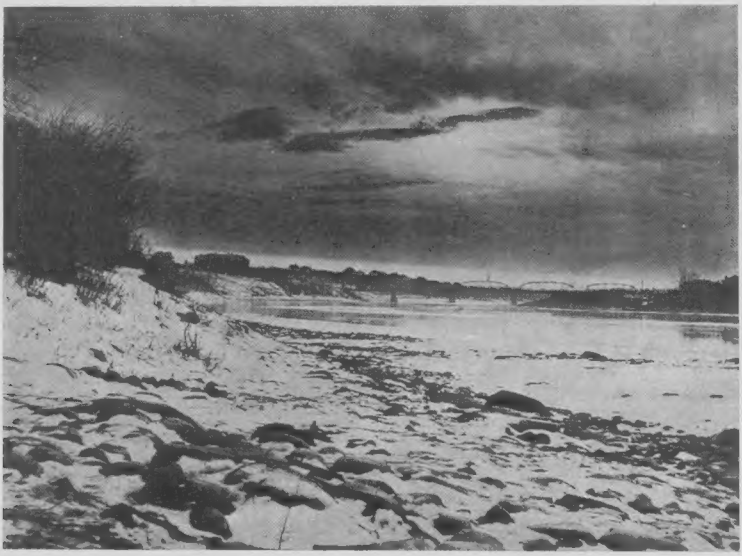

FIG. 4.—A reach of the Saskatchewan river, near Saskatoon, showing a rapid where the larvæ of black-flies are to be found attached to the surface of water-washed stones. (Original).

*Washburn, F. L., Diptera, of Minnesota, Bulletin, No. 93, Agr. Exper. Stat. Univ. Minn., 1905, pp., 75-76.

Phinotas oil* in streams, it was observed that a film of oil may be found upon stones 48 hours after application, and the black-fly larvae may be killed one-eighth of a mile below the point of application.

A small stream, which drains a swampy area and debouches into the Saskatchewan river about 3 miles south of Saskatoon, was found to contain the larvae of three different kinds of black-fly, and in this particular instance treatment with Phinotas oil would have supplied the necessary remedy.

HORSE-FLIES

The flies belonging to this family are also variously known as breeze-flies, clegs and deer-flies. The name, however, by which the larger horse-flies of the prairies are most generally known is "bull-dogs," which conveys some idea of their pertinacious biting habits. The adults frequent marshy places and are commonly encountered in the vicinity of sloughs in large numbers. Here they lay their eggs on the leaves of aquatic plants, and the larvae inhabit the muddy bottoms and margins of these ponds. The larvae are carnivorous, preying upon slugs, worms, and the larvae of other insects, whilst in captivity they do not hesitate to devour their own kind.

The most commonly occurring species in the environment of Saskatoon is *Tabanus septentrionalis* Loew, (Fig. 5), which is extremely variable in its colouration and size. It was our experience that this species displayed a marked tendency to seek shade. When an automobile with the cover up was stationed near a slough they swarmed around it in large numbers, circling it in rapid flight and finally entering and resting on the roof, or on the mud-guards and sides outside. By the same token, they were often found at rest on the outside walls of dwelling-houses and inside on the windows, associated with *Tabanus illotus* O.S. and *Tabanus hirtulus* Bigot. In lesser numbers *Tabanus phaenops* O.S., *Tabanus rhombicus* O.S., *Tabanus cantonis* Marten, and *Tabanus eristatus* also occurred.

FIG. 5.—A common prairie "bull-dog" fly, *Tabanus septentrionalis*, prevalent in the vicinity of slough, and persistent in its attacks on horses and cattle (Original).

None of these species were found to be aggressive in their attitude to human beings, but they were persistent in their attacks on horses and cattle grazing on the prairies. The provision of fly-nets for horses at work is ample protection against these flies.

Of the genus *Chrysops*, all of which have pictured wings, *Chrysops moerens* Walk. (Fig. 6) and *Chrysops fulvaster* O.S. were the only two species found during the summer. Around the sloughs near Dundurn the former was very common. In the grass at the margins of these sloughs, they were readily disturbed as one walked along and they were not slow to attack human beings. The latter was only encountered in low swampy ground and was taken in large numbers. It does not hesitate to attack those who intrude in its preserves.

The delicate, grayish-black breeze-fly *Haematopota americana* O.S., with grayish pictured wings, is occasion-

* Phinotas oil is a preparation made by the Phinotas Chemical Company of New York and is a powerful larvicide. The great objection to its use is that fish also succumb to its poisonous properties. (Smith, J. B., Mosquitoes of New Jersey, Trenton, N.J., 1904, pp. 128, 129).

ally found around horses and readily settles on people in the vicinity. In its flight it makes very little noise and is very quiet and unobtrusive as it settles to bite.

For those horse flies which attack the ears of horses nets will be found useful as a protection. In cases where the eyes are also attacked, the ears and skin about the eyes may be smeared with the following repellent solution as recommended in Bull. No. 93, Agr. Exper. Station, Univ. Minn., 1905:—Pine tar one gallon; kerosene, or fish oil, or crude carbolic acid one quart; powdered sulphur two pounds. This mixture, also, applied to wounds made by barbed wire or otherwise, will ward off those flies which might be disposed to lay their eggs therein.

FIG. 6.—The breeze-fly or deer-fly, *Chrysops moerens* commonly occurring near sloughs and attacking human beings and live stock. In its flight it makes less noise than the "bull-dog" fly. (Original.)

In Russia, Portchinsky* has taken advantage of the habits of horse-flies of concentrating in large numbers in damp places and near pools at which they drink. He found that during the heat of the day the flies rapidly skim the surface of the water in order to drink, only the underside of their bodies touching the water. Very good results were obtained by pouring kerosene on the surface of these pools of stagnant water and it was found that these "pools of death," as he called them, soon became covered with the dead bodies of horse-flies which frequented them. Contact with the kerosene, which adhered to their bodies, rapidly poisoned or suffocated the flies. The author advocates the use of "pools of death" in pastures where cattle graze, but they should always be securely fenced off.

In Canada, Mr. Norman Criddle, Field Officer of the Entomological Branch, made independent observations and experiments in 1914 and 1916 in Manitoba similar to those of Portchinsky in Russia. In 1914 he noticed the habits which horse-flies display of making rapid, skimming flights along the surface of exposed water. Like the Russian author, too, he found that the great majority of the flies that thus behaved were males, only a very small percentage of females coming to drink at open water. In experiments covering a period of 5 days in a pool but one square metre in surface area, Portchinsky counted in all 1,967 horse-flies of which only 14 per cent were females.

My thanks are due to Professor J. S. Hine, Ohio State University, who kindly confirmed the identification of some of the specimens of horse-flies and also named others about which there was some uncertainty. I am also indebted to Professor T. N. Willing, University of Saskatchewan, Saskatoon, Sask., for the loan of the photograph for figure No. 4.

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* Portchinsky, L. Tabanidæ and the Simplest Methods of Destroying them. Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture, Petrograd, vol. ii, No. 8, 1915. Abstract in Rev. App. Entom. Ser. B., vol. III, 1915, pp. 195-196, 1916.

Dr. L. O. Howard, Bureau of Entomology, Washington, D.C., was the first to attract attention to Portchinsky's discovery in "A Remedy for Gadflies: Portchinsky's Recent Discovery in Russia, with some American Observations." This was published in Bulletin No. 20, Division of Entomology. United States Department of Agriculture, 1899. The Russian author had previously published an account of his findings this same year.